

APRIL/MAY 2024

**CASC42/FASC42/BASC42 —
QUANTITATIVE TECHNIQUES – II**

Time : Three hours

Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL the questions.



1. What do you mean by PERT and CPM?
2. Define pessimistic time.
3. What is inventory problem in operation research?
4. What is meant by shortage cost?
5. Define total elapsed time.
6. List the basic assumptions underlying a sequencing problem.
7. What is a fair game?
8. State the assumptions for a two-person zero sum game.

9. What is replacement decision?
10. State the conditions under which group replacement is superior to individual replacement.

SECTION B — (5 × 5 = 25 marks)

Answer ALL the questions.

11. (a) A project schedule has the following characteristics

Activity:	1-2	1-3	2-3	2-5	3-4	3-6	4-5	4-6	5-6	6-7
Time :	15	15	3	5	8	12	1	14	3	14

Construct a network and find the critical path.

Or

- (b) Write the various steps involved in developing PERT network.

12. (a) Use the following information, find

(i) EOQ and

(ii) Optimum time between orders:

Annual demand = 18,000 units

Set-up cost = Rs. 400

Holding cost per unit = Rs. 1.20/year.

Or



19. Determine the saddle point for the game with the following pay-off matrix.

		Player B			
		I	II	III	IV
Player A	1	2	-1	0	-3
	2	1	0	3	2
	3	-3	-2	-1	4

20. The cost of a new machine is Rs. 5,000. The maintenance cost during the n^{th} year is given by $M_n = \text{Rs. } 500 (n-1)$ where $n=1,2,3,\dots$ if the discount rate per year is 0.05, after how many years will it be economical to replace the machine by a new one?

- (b) A certain item costs Rs. 235 per ton. The monthly requirement is 5 tons and each time the stock is replenished there is a set-up cost of Rs. 1,000. The cost of carrying inventory has been estimated at 10% of the value of the stock per year. What is the optimal order quantity?

13. (a) Six jobs go first over machine I and there over machine II. The order of the completion of jobs has no significance. The following table gives the machine times in hours for six jobs and the two machines.

Job Nos. :	1	2	3	4	5	6
Time on Machine I :	5	9	4	7	8	6
Time on Machine II :	7	6	8	3	9	5

Find the sequence of jobs that minimizes the total elapsed time to complete the jobs.

Or

- (b) Solve the following sequencing problem giving an optimal solution when passing is not allowed

	A	B	C	D	E
Machine M_1 :	10	12	8	15	16
Machine M_2 :	3	2	4	1	5
Machine M_3 :	5	6	4	7	3
Machine M_4 :	14	7	12	8	10



14. (a) Examine whether the following 2×2 games has a saddle point.

	Player B	
Player A	3	5
	4	2

Or

- (b) Explain the method of solving 2×2 game without saddle point.
15. (a) What are the factors affecting the replacement problem?

Or

- (b) A machine owner finds from his past records that the costs per year of maintaining a machine whose purchase price is Rs. 6,000 are as given below:

Year:	1	2	3	4	5	6
Maintenance cost (Rs.)	1,000	1,200	1,400	1,800	2,300	2,800
Resale value (Rs.)	3,000	1,500	750	375	200	200

Determine at what age is replacement due?

SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. For a small project of 12 activities, the details are given below. Draw the network and compare earliest occurrence time, latest occurrence time, critical activities and project completion time :

Activity:	A	B	C	D	E	F	G	H	I	J	K	L
Dependence:	—	—	—	BC	A	C	E	E	DFH	E	IJ	G
Duration (days):	9	4	7	8	7	5	10	8	6	9	10	2

17. Using the following information, obtain the EOQ and the total variable cost associated with the policy of ordering quantities of that size.

Annual demand = Rs. 20,000, ordering cost — Rs. 150 per order and inventory carrying cost is 24% of average inventory value.

18. Solve the following sequencing problem:

Job:	J ₁	J ₂	J ₃	J ₄	J ₅	J ₆
Machine A :	1	3	8	5	6	3
Machine B :	5	6	3	2	2	10